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Cost analysis of poisoning cases admitted to the emergency department

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ABSTRACT

Aims: Poisoning incidents are frequently encountered and can often result in fatal outcomes in emergency departments. This study aimed to examine the demographic characteristics of patients diagnosed with drug poisoning in the emergency department and to analyze the associated healthcare costs.

Methods: The study retrospectively analyzed patients admitted to the Nevşehir State Hospital emergency service between January 1, 2017, and December 31, 2018, due to both accidental and intentional drug poisoning. The number of patients diagnosed with drug poisoning in the emergency department was assessed by month and year. Aspects such as the demographic characteristics of the patients, the times of their admission to the emergency department, the outcomes in the emergency department, and the associated costs were compared.

Results: The emergency department received a total of 520,672 patients. Among these, 659 patients who were diagnosed with drug poisoning and had complete data were included in the study. Women constituted 65% of the study population. The patients were categorized into two groups: children under the age of 18 and adults aged 18 and over. The average age of the pediatric patients was 7.7, while the mean age of the adult patients was 30.2. When the emergency service costs were compared with the age and gender variables of the admissions, no statistically significant difference was observed ($p>0.05$). However, a statistically significant difference was noted in terms of cost when the times of admission for patients in the emergency department were compared ($p<0.05$).

Conclusion: Given the morbidity and mortality rates associated with poisoning, the financial burden it imposes is substantial. It is necessary to develop targeted preventive health services to reduce the incidence of poisoning cases.

Keywords: Emergency department, poisoning, cost

INTRODUCTION

Poisoning refers to the emergence of undesirable signs and symptoms in the organism due to exposure to potentially harmful chemical, physical, or organic substances.[1] Poisoning, which is one of the most common causes of emergency service admissions; it is an important public health problem all over the world with its high relationship with mortality.[2,3] There are many causes of poisoning, such as alcohol, drugs, illegal substance use, some foods, carbon monoxide and various chemicals.[4]

Although the tendencies and causes of poisoning differ between geographical regions, early diagnosis helps to reduce morbidity and mortality.[3] Causes of poisoning can be grouped as accidental, suicidal and substance abuse.[2] Regardless of the cause, poisonings are accepted as forensic; again, when the health care cost amounts are evaluated, the burden it brings to the country's economy cannot be ignored.[5]

In this study, cases diagnosed with poisoning due to both accidental events and suicidal drug intake in the emergency department were examined. It was aimed to investigate the relationship between data such as demographic characteristics, admission times, outcome status of the patients, and associated costs.

METHODS

Our study was conducted in accordance with research and publication ethics, and approval was obtained from the Nevşehir Hacı Bektaş Veli University Ethics Committee (Date: 21.02.2022, Decision No: 2022.01.06). All procedures were carried out in accordance with the ethical rules and the principles of the Declaration of Helsinki.

Patient visits to the Nevşehir State Hospital emergency department between 01.01.2017-31.12-2018 due to both accidental events and poisoning due to suicidal drug intake were analyzed retrospectively. Patients with ICD-10 diagnosis code X44 were recruited after preliminary evaluation. Through the hospital registration system; A data set including the demographic characteristics of the patients, the time of admission to the emergency department (year, month and hour basis), the emergency service costs

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and the outcome was created. Cases involving alcohol and substance use, as well as food or smoke-related poisoning, were not included in the study. Again, patients with missing data entries through the registration system were excluded from the study.

The number of patients diagnosed with drug poisoning in the emergency department was evaluated according to months and years. The demographic characteristics of the patients, the hours of admission to the emergency department, the outcome in the emergency department, and the cost of the emergency department were compared.

The conformity of the data to the normal distribution was evaluated by histogram, Q-Q plots, and the Shapiro-wilk test. Mann-Whitney U test was used for quantitative variables in comparisons between groups. The Kruskal Wallis test was used for comparisons between groups of more than two. Dunn-Bonferroni test was used for multiple comparisons. Analysis of the data was carried out in the software R 4.0.3 (www.r-project.org). Significance level was accepted as $p<0.05$.

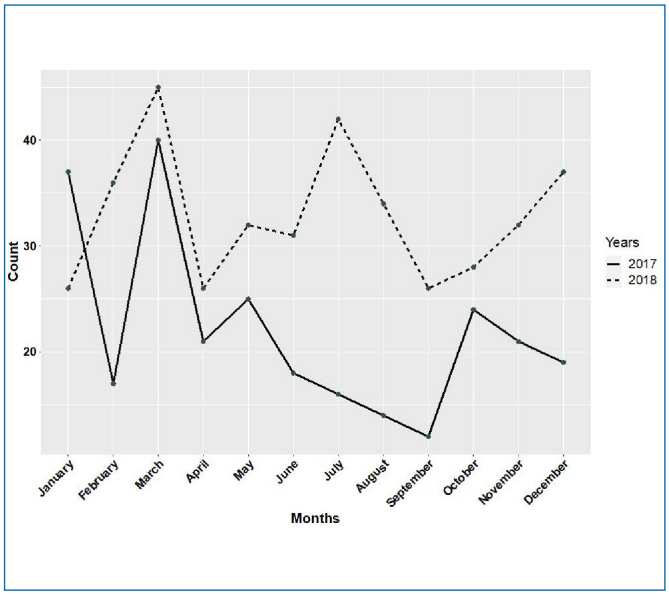

Figure 1. Distribution of poisoning cases by months and years

RESULTS

During the two-year study period, a total of 520,672 patients visited the emergency department. A total of 659 patients who were diagnosed with poisoning due to drug intake in the emergency department and whose data were not deficient were included in the study. When compared to all applications to the emergency department, poisoning due to drug intake constitutes 0.12% of the applications. 65% of the patients included in the study were women. The patients were divided into two groups as children under 18 years of age and adults aged 18 years and over. The mean age of pediatric patients was 7.7; The mean age of adult patients was calculated as 30.2. While 293 (68.4%) of the female patients applied for suicide; 133 (57.5%) of male patients applied. While 78 (32.2%) of the patients under the age of 18 took drugs for suicide, 348 (83.4%) of the adult patients took drugs. Infants and young children are much more likely to take drugs accidentally. The cost analyzes of the patients were determined by calculating the procedures performed in the emergency department for each patient and calculating the costs per patient. Age and gender variables of the admissions were compared with the costs of the emergency department, and no statistically significant difference was found ($p>0.05$) (**Table 1**).

Table 1. Comparison of demographic data with cost amounts

	n (%)	Cost (TL)	p
Gender			0.055
Female	428 (65%)	192.0 (143.0-256.8)	
Male	231 (35%)	176.0 (120.0-267.0)	
Age			0.149
<18	242 (36.7%)	186.0 (120.8-263.3)	
≥18	417 (63.3%)	192.0 (137.0-257.5)	

During the study period, the distribution of the number of patients diagnosed with poisoning due to drug intake in the emergency department by months and years was examined (**Figure 1**). The number of patients admitted due to poisoning was higher in 2018 (59.9%). It was observed that the number of applications in March was higher than the other months in both years.

The time of admission of the patients to the emergency department; they were divided into three groups as 08:00-15:59, 16:00-23:59 and 00:00-07:59. The highest number of applications was made between 16:00-23:59 hours (50.2%). The cost of emergency department for patients diagnosed with drug poisoning was calculated as 72,648 Turkish Lira (₺) (approximately $20,000) for 2017 and 130.811 ₺ (approximately $27,000) for 2018. While calculating the cost of 2017, only emergency service costs are taken into account, hospitalization or referral costs are not included. The hours of admission and the cost of the patients in the emergency department were compared. There was a statistically significant difference in cost between the patient group admitted between 16:00-23:59 hours and the patient group admitted between 00:00-07:59 hours ($p<0.05$) (**Table 2**).

According to the patients' outcome; were divided into 4 groups as referral to another institution, discharge from the emergency department, hospitalization in the department and hospitalization in the intensive care unit. Most of the patients were discharged from the emergency department (66.8%). The outcome status of the patients and their costs in the emergency department were compared, and no statistically significant difference was found ($p>0.05$) (**Table 2**).

Table 2. Comparison of patients' admission hours and outcomes with cost amounts

	n (%)	Cost (TL)	p
Application Time			0.027
08:00-15:59	204 (31%)	188.0 (132.0-263.0)[ab]	
16:00-23:59	331 (50.2%)	195.0 (137.0-282.0)[a]	
00:00-07:59	124 (18.8%)	176.5 (119.3-231.5)[b]	
Ending			0.455
Transport	56 (8.5%)	191.0 (121.0-261.5)	
Discharged	440 (66.8%)	185.5 (131.0-256.0)	
Hospitalization (Service)	137 (20.7%)	201.0 (144.5-278.5)	
Hospitalization (ICU)	26 (4%)	194.5 (148.5-278.5)	

*The same letters in the same column indicate the similarity between the groups, and different letters indicate the difference. * ICU: Intensive Care Unit

DISCUSSION

Poisoning; it is one of the most common causes of emergency department admissions and hospitalizations worldwide in relation to its high mortality and morbidity rates.[2,6] There are many factors affecting poisonings such as geographical conditions, socio-cultural level, education and seasons.[7] Cases of poisoning; in addition to causing an increase in patient density, it is considered as a burden in the health system worldwide due to its social and economic effects.[4]

In the study of Doğan et al.[1] in which they evaluated the poisoning cases who applied to the emergency department over a one-year period; 0.77% of all patients admitted to the emergency department were diagnosed with poisoning. In our study, similar to this study, although the total number of patients who applied to the emergency department was close to each other; the rate of patients diagnosed with poisoning was found to be 0.12%. Since only the patients diagnosed with drug poisoning were included in our study, the rate was thought to be lower compared to the study of Doğan et al.[1]

Similar to the literature, the majority of the patients included in the study were women.[8-10] There are studies emphasizing that this is due to the presence of societal pressure on women in some cultures and the delayed use of medical care.[6] In the study, the mean age was calculated separately for patients younger than 18 years of age; when compared with studies conducted with similar groups, the mean age was found to be similar to the literature.[3,11,12] Independently of factors such as age and gender in emergency services, the basis of the procedures applied in cases diagnosed with drug poisoning is similar. For this reason, the cost of health care services does not make a significant difference when compared with these factors.

It has been reported that suicidal cases are more common in March and April; carbon monoxide poisoning associated with the use of heating equipment and mushroom poisoning are more common in the winter months.[1] In this study, the higher number of patients in the spring and summer months was attributed to the fact that cases other than drug-induced poisoning were not included in the study. However, it is thought that the cases are high in March and April due to the fact that suicidal cases apply in the form of poisoning due to drug intake.

Similar to the studies conducted by both Dal et al.[8] and Deniz et al.[13] in which cases admitted to the emergency department due to poisoning were evaluated, it was found that the most frequent admission was between 16:00 and 23:59 hours in this study. It was thought that most applications to the emergency service were made during this time period, since there was no alternative unit that could provide health services other than the emergency service after working hours and the hours when all family members were at home, especially in suicidal applications. In the previous studies; it has been emphasized that the health care costs of patients admitted with poisoning are a major burden on the health system economy.[4,5,7] It was determined that the cost of emergency service care increased in the years during the study period compared to the previous year; the increase in the number of patients, inflation and changes in care services are thought to be the factors that cause this. However, there is a statistical difference between the application hours in terms of cost amounts; This may be due to the fact that the number of patients admitted between these hours is higher compared to other time intervals and that the cost of the treatments applied is high due to the fact that the majority of drug intake are for suicidal purposes.

Similar to the literature, most of the patients were discharged from the emergency department.[3,9] It was thought that most of the patients were discharged from the emergency department because of the completion of the treatment and follow-up of poisoning cases due to non-toxic drug intake in the emergency departments, and the discharge of the patients and their companions who declined hospitalization. In this study, only the emergency service care costs were calculated, since the ongoing care costs of the patients outside the group discharged from the emergency room were not added; It was thought that there was no statistical difference between the cost amounts and the outcome status of the patients.

The biggest limitation of our study is that it was single-centered and retrospective. More detailed data can be evaluated through multicenter and prospective studies with larger patient groups.

CONCLUSION

Poisoning has an important place among all patient groups admitted to the emergency department due to high mortality, morbidity rates and health care costs. Especially in the prevention of poisoning due to drug intake; It may be helpful to control over-the-counter drug sales, to make drugs in forms that will not attract the attention of children or to open them, and to keep them out of reach of children, and not to keep unnecessary and excess drugs at home. Again, as a result of a raising awareness of people about unnecessary drug use and suicidal cases at the stage of preventive health services, health care costs due to poisoning will be reduced.

ETHICAL DECLARATIONS

Ethics Committee Approval: The study was carried out with the permission of Nevşehir Hacı Bektaş Veli University Ethics Committee (Date: 21.02.2022, Decision No: 2022.01.06).

Informed Consent: Because the study was designed retrospectively, no written informed consent form was obtained from patients.

Referee Evaluation Process: Externally peer-reviewed.

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